NATIONAL DEFENSE RESEARCH INSTITUTE

Using The Steel Vessel Material Cost Index To Mitigate Shipbuilder Risk

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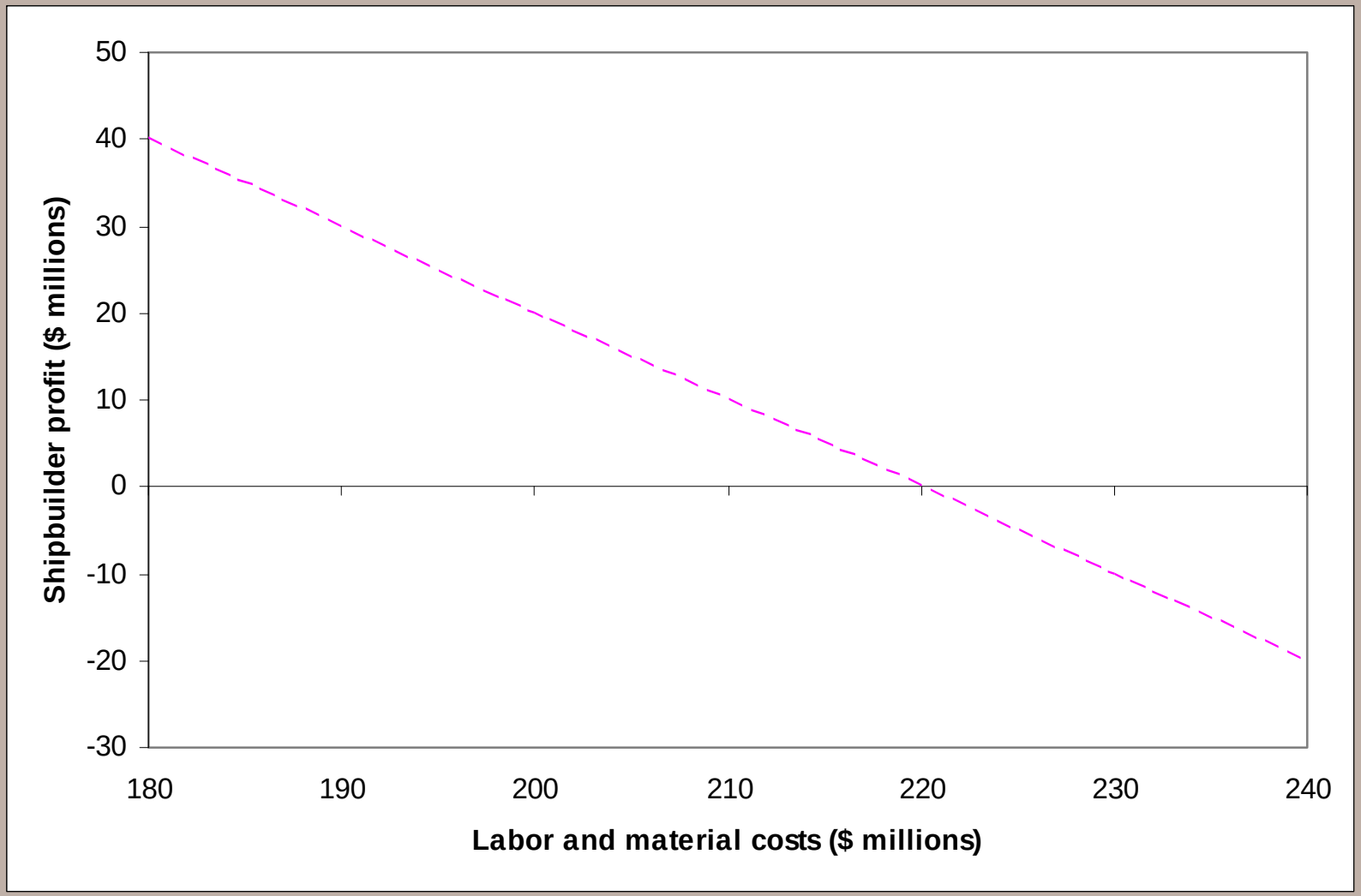
Outline

- **How the Navy Uses Material Cost Indexes**
- **The Steel Vessel Material Cost Index and Its Shortcomings**
- **Prospective Reforms**

If The Navy Used A Fixed-Price Contract, Shipbuilder Profit Would Vary Dollar-per-Dollar With Realized Cost



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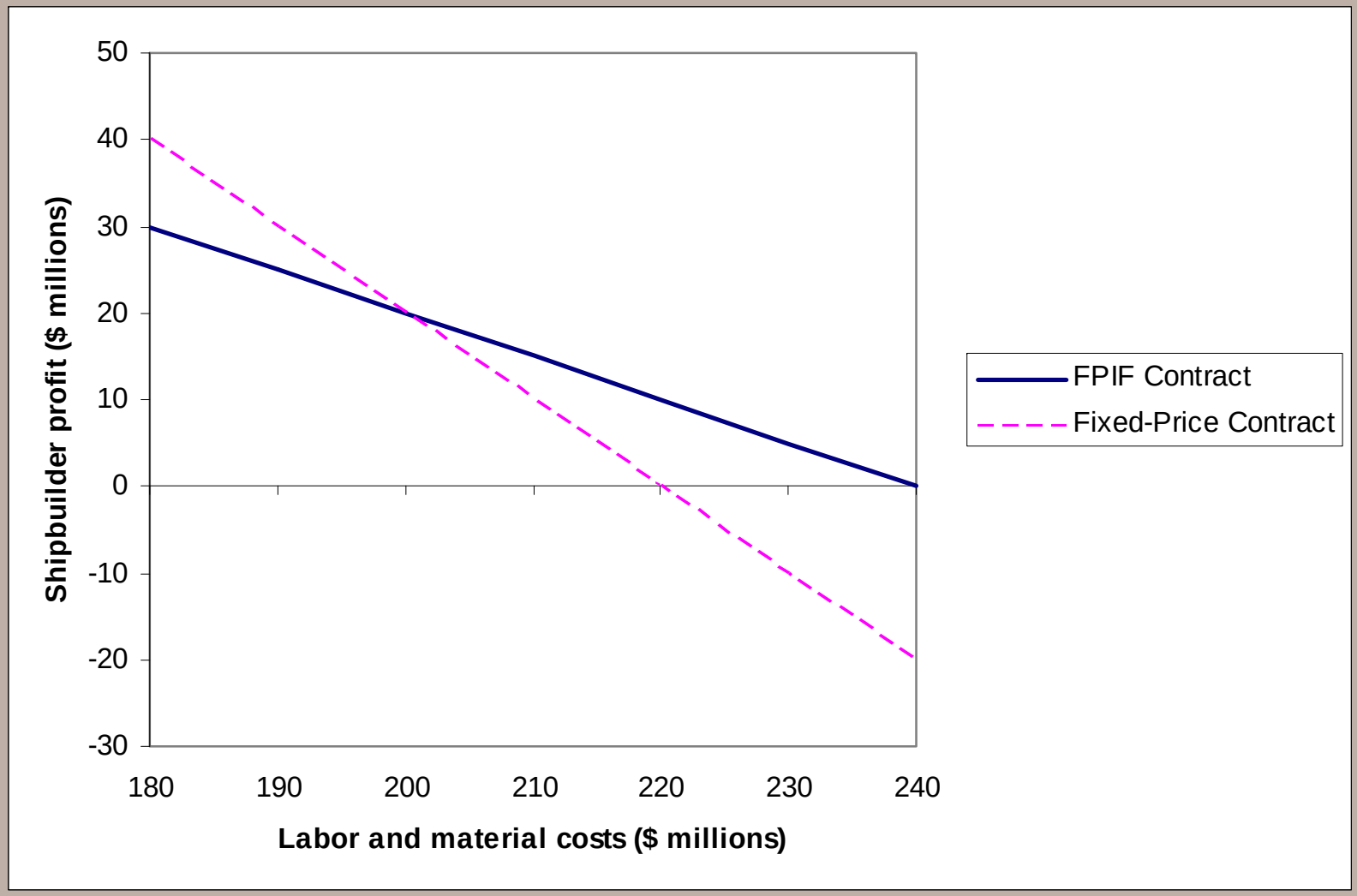
Fixed-Price, Incentive Fee Contracts Imply Navy-Shipbuilder Cost Change Sharing



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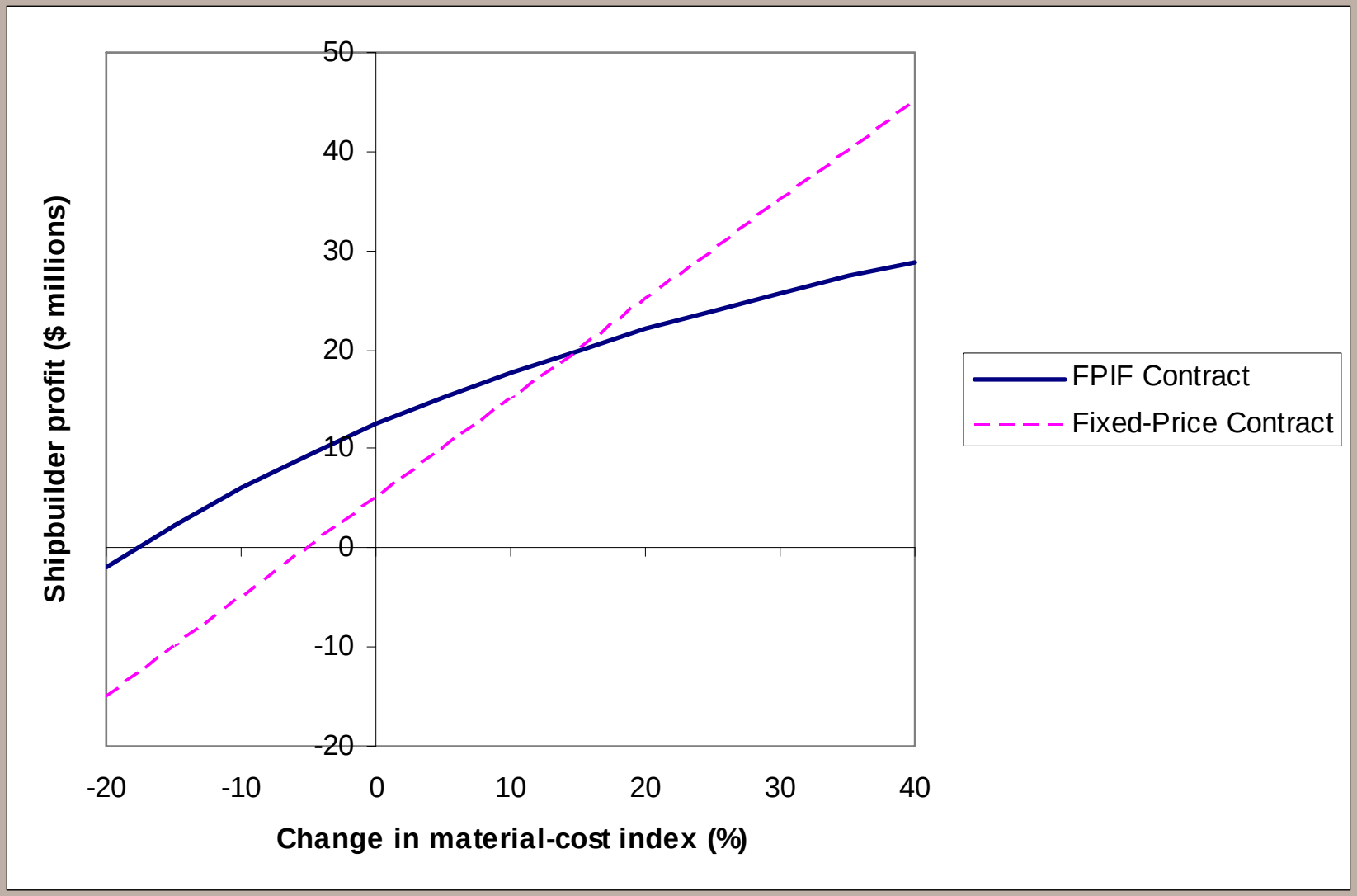
Material and Labor Cost Indexes Are To Adjust For Exogenous Cost Changes

- **It would not be reasonable to expect a risk-averse shipbuilder to bear risk of economy-wide inflation**
  - **Though, for a high enough price, shipbuilders will bear any risk**
  - **In equilibrium, the Navy does not want to pay risk-averse shipbuilders to bear such risk**
- **An appropriately chosen index adjusts expected costs to account for inflation then shipbuilder's realized costs are measured relative to the adjusted level**
  - **Shipbuilder is rewarded if actual costs do not increase as much as the index suggests**
  - **Shipbuilder is penalized if actual costs increase more than the index suggests**

Holding Realized Costs Fixed, The Shipbuilder Has Greater Profit When The Chosen Index Rises More



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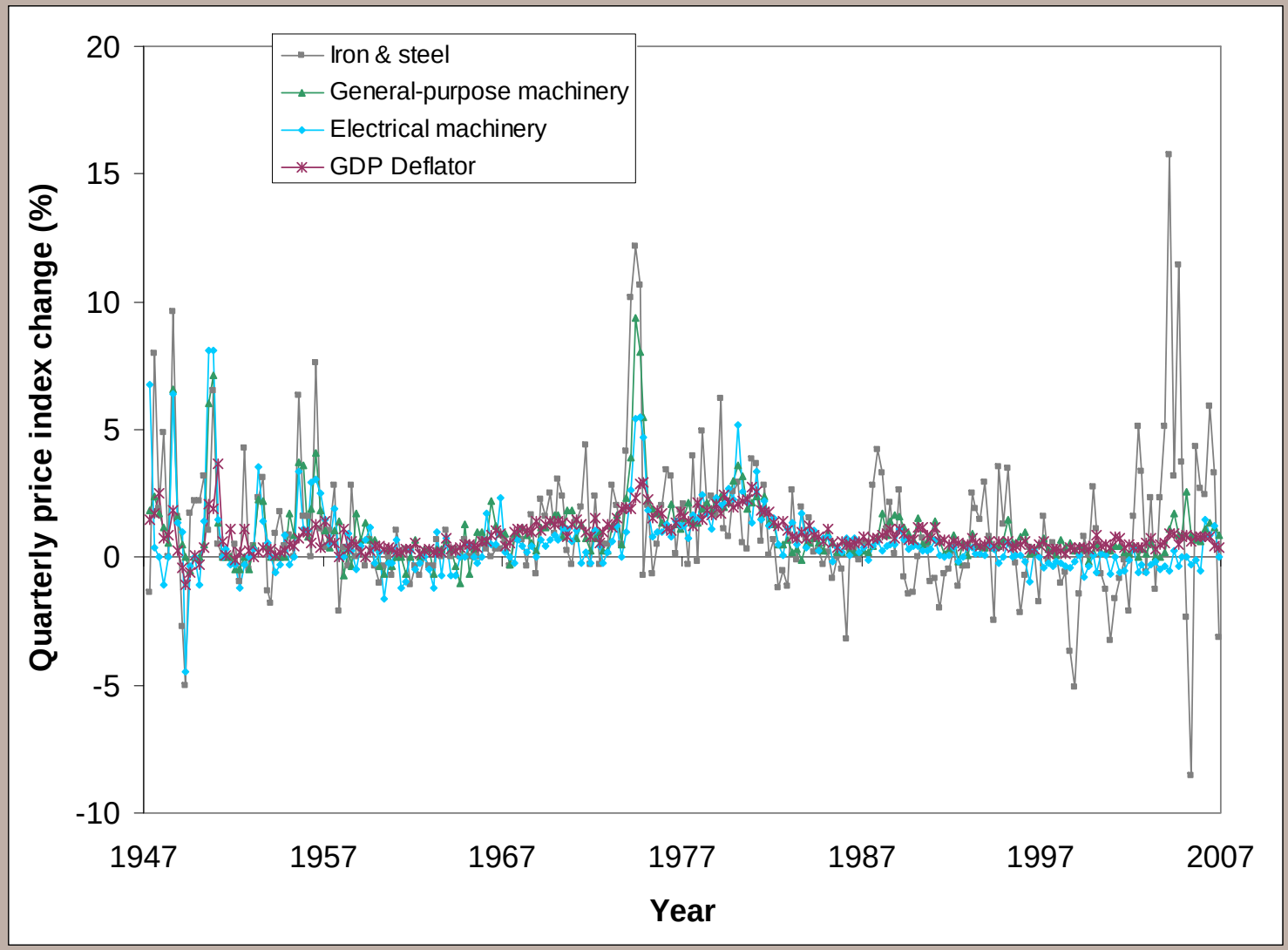
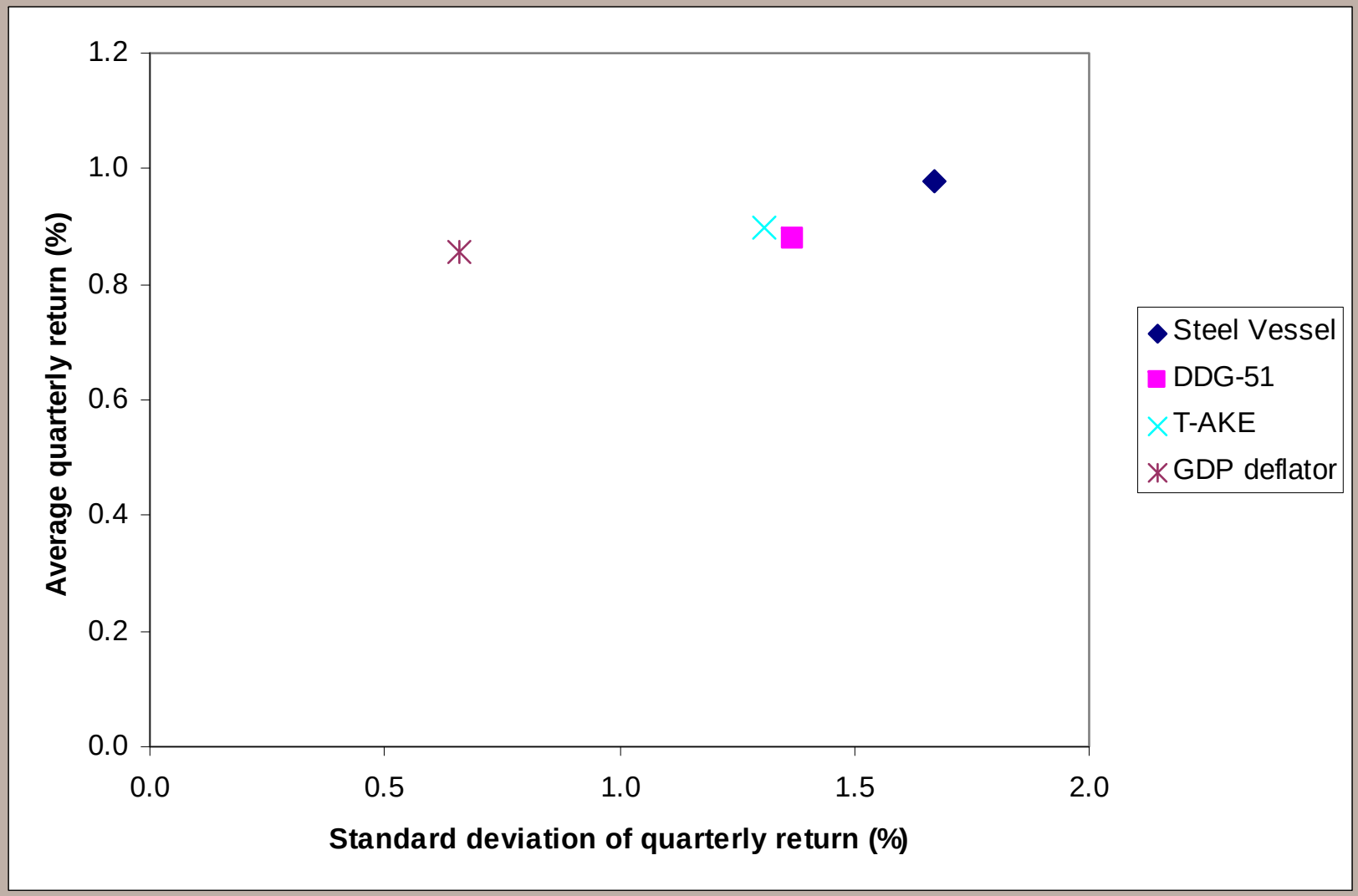
The Navy Frequently Uses The Steel Vessel Material Cost Index

- **Steel Vessel Index is a weighted average of three BLS producer price indexes**
  - **45% Iron & Steel**
  - **40% General Purpose Machinery and Equipment**
  - **15% Electrical Machinery and Equipment**
- **Used in many Navy programs including CVN-77 and LHD-8**
- **Problem: The Steel Vessel Index does not accurately represent materials used on modern ships, e.g., too much weight on Iron & Steel**
  - **Geismar's *1975* NPS thesis argued it was an inappropriate index!**
- **Some other programs (e.g., DGG-51, LPD, T-AKE) have used different material cost indexes with lower weight on Iron & Steel**

The Over-Emphasized Iron & Steel Index Is Very Volatile



The Steel Vessel Index Has A Greater Mean And, Perhaps More Importantly, Greater Variance Than Other Indexes



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A Badly Chosen Material Cost Index Introduces New Risk

- **The shipbuilder now faces the risk his or her actual costs will grow more than the mis-weighted Steel Vessel Index**
  - **A big concern is the possibility the price of steel will fall without shipbuilder costs falling commensurably**
  - **We term this "cost structure mismatch-driven risk"**
- **In equilibrium, shipbuilders will demand greater prices to bear this new risk**

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A Re-weighted Material Cost Index Is A Straightforward Solution To Steel Vessel Index Shortcomings

- **DDG-51, LPD, and T-AKE have gone in this direction**
  - **Lower weight on Iron & Steel**
- **But we think the Navy can do yet better…**

Current Material Cost Indexes Do Not Consider Time-Phasing

- **In reality, the types of materials a shipbuilder purchases vary over a ship's construction process**
  - **Keel steel is purchased early**
  - **Electronics are purchased late**
- **One could construct a time-phased index with weights that evolve (e.g., greatest Iron & Steel weight early) over time**

Is It Worth Refining Navy Material Cost Indexing?

- **The Steel Vessel Index is well-known which is virtuous if it implies shipbuilders accept lower prices when it is in use**
- **An index with lower weight on Iron & Steel like the DDG-51, LPD, and T-AKE material cost indexes is an improvement**
  - **A more accurate representation of shipbuilder costs**
- **Time-phasing would be more complicated but probably more valid**
  - **In equilibrium, we expect the Navy to pay less for ships when it reduces risk-averse shipbuilder exogenous risk more accurately**
- **Improving material cost indexing right is a "small problem" but it is multiplied by a large number, i.e., the Navy's shipbuilding budget**